MITSUBISHI ELECTRIC

General-Purpose AC Servo

MITSUBISHI SERVO AMPLIFIERS & MOTORS

MELSERVO-J4

MR-J4-DU30K_/MR-J4-DU37K_
MR-J4-DU30K_4 to MR-J4-DU55K_4
MR-CR55K/MR-CR55K4

Instructions and Cautions for Safe Use of AC Servos

Country/Region	Sales office	Tel/Fax
USA	MITSUBISHI ELECTRIC AUTOMATION, INC. 500 Corporate Woods Parkway, Vernon Hills, IL 60061, U.S.A.	Tel : +1-847-478-2100 Fax: +1-847-478-2253
Germany	MITSUBISHI ELECTRIC EUROPE B.V. German Branch Gothaer Strasse 8, D-40880 Ratingen, Germany	Tel : +49-2102-486-0 Fax: +49-2102-486-1120
China	MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD. No.1386 Hongqiao Road, Mitsubishi Electric Automation Center, Changning District, Shanghai, China	Tel : +86-21-2322-3030 Fax: +86-21-2322-3000
Korea	MITSUBISHI ELECTRIC AUTOMATION KOREA CO., LTD. 1480-6, Gayang-Dong, Gangseo-Gu, Seoul, 157-200, Korea	Tel : +82-2-3660-9510 Fax: +82-2-3664-8372/8335

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BLDG MARUNOUCHI TOKYO 100-8310

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This guide uses recycled paper.
Specifications are subject to change without notice.

Contents of the package
Unpack the product and check the rating plate to see if the servo amplifier is as you ordered.

(1) Converter unit

Contents	Quantity
Converter unit	1
Eyebolt	2
MR-J4-DU/MR-CR Instructions and Cautions for Safe Use of AC Servos (this guide)	1

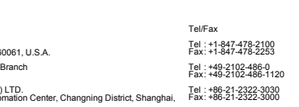
(2) Drive unit

Contents	Quantity
Drive unit	1
Bus bar	2
Eyebolt	2
MR-J4-DU/MR-CR Instructions and Cautions for Safe Use of AC Servos (this guide)	1

Rating plate
The following shows an example of rating plate for explanation of each item.

Converter unit

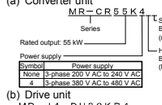
Drive unit



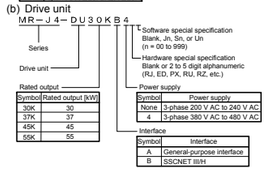
Warning plate

Model
The following describes what each block of a model name indicates. Not all combinations of the symbols are available.

(a) Converter unit



(b) Drive unit



1. About the manuals

Converter units and drive units are written as servo amplifiers in this guide under certain circumstances.

1.1 MELSERVO MR-J4 relevant manuals

This installation guide explains how to mount MR-J4 servo amplifiers. You can also check it with our website for free.
http://www.mitsubishielectric.com/fa/
If you have any questions about the operation or programming of the equipment described in this guide, contact your local sales office.
In addition, when you mount a protective device, specific technical skills which are not detailed in the guide will be required.

1.2 Purpose of this guide

This installation guide explains the safe operation of MR-J4 servo amplifiers for engineers of machinery manufacturers and machine operators. This installation guide does not explain how to operate machines in which safety servo system is, or will be integrated. For detailed information of the products, refer to each servo amplifier instruction manual.

1.3 Terms related to safety

1.3.1 IEC 61800-5-2 Stop function
STO function (Refer to IEC 61800-5-2: 2007 4.2.2.2 STO.)
MR-J4 servo amplifiers have the STO function. The STO function shuts down energy to servo motors, thus removing torque. This function electronically cuts off power supply in the servo amplifier.

2. About safety

This chapter explains safety of users and machine operators. Please read the chapter carefully before mounting the equipment. In this installation guide, the specific warnings and cautions levels are classified as follows.

⚠ WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight injury to personnel or may cause physical damage.

2.1 Professional engineer

Only professional engineers should mount MR-J4 servo amplifiers.
Here, professional engineers should meet the all conditions below.
(1) Persons who took a proper engineering training or qualified persons who are engaged in electrical equipment. Check if applicable technical training is available at your local Mitsubishi Electric office. Contact your local sales office for schedules and locations.
(2) A person who can access to operating manuals for the protective devices (e.g. light curtain) connected to the safety control system. A person who have read and familiarized himself/herself with the manuals.

2.2 Applications of the devices

MR-J4 servo amplifiers comply with the following standards.
ISO/EN ISO 13849-1 Category 3 PL d, IEC/EN 62061 SIL CL 2, IEC/EN 61800-5-2 SIL 2 (STO), IEC/EN 61800-5-1, IEC/EN 61800-3, IEC/EN 60204-1
In addition, MR-J4 servo amplifiers can be used with the MR-J3-D05 safety logic unit, or safety PLCs.

2.3 Correct use

Always use the MR-J4 servo amplifiers within specifications (voltage, temperature, etc. Refer to each instruction manual for details.). Mitsubishi Electric Co. accepts no claims for liability if the equipment is used in any other way or if modifications are made to the device, even in the context of mounting and installation.

⚠ WARNING ● It takes 20 minutes for capacitor discharging. Do not touch the unit and terminals immediately after power off.

2.3.1 Selection of peripheral equipment and wire
The followings are selected based on IEC/EN 61800-5-1, UL 508C, and CSA C22.2 No.14.
(1) Local wiring and crimping tool
Use only copper wires or copper bus bars for wiring. The following table shows the stranded wire sizes [AWG] and the crimp terminal symbols rated at 75 °C/60 °C.

Table 1. Recommended wire

Drive unit	Converter unit	75 °C/60 °C stranded wire [AWG] (Note 2)			
		L1/L2/L3 ⏚	L11/L21	P2/C	U/V/W/⏚ (Note 3)
MR-J4-DU30K_ (Note 1)	MR-CR55K	1: c/1/0: -	14: g/14: g	10: a/10: a	2/0: d/2/0: -
MR-J4-DU37K_ (Note 1)		2/0: d/2/0: -			2/0: d/-: -
MR-J4-DU30K_4 (Note 1)	MR-CR55K4	4: e/3: f			3: f/2: f
MR-J4-DU37K_4 (Note 1)		2: f/1: c			2: f/1: c
MR-J4-DU45K_4 (Note 1)		2: c/2: -			1/0: d/1/0: -
MR-J4-DU55K_4 (Note 1)		2: c/1/0: -			1/0: d/2/0: -

Table 2. Recommended crimp terminal

Symbol	Servo amplifier-side crimp terminals		Manufacturer
	Crimp terminal (Note 2)	Applicable tool	
a	FVD5.5-10	YNT-1210S	JST (J.S.T. Mfg. Co., Ltd.)
b	FVD2-10	YNT-1614	
c (Note 1)	R38-10	YPT-60-21 YF-1/E-4	
d (Note 1)	R60-10	YPT-60-21 YF-1/E-4	
e	FVD22-8	YF-1/E-4 YPT-60-21	
f (Note 1)	R38-8	YF-1/E-4 YPT-60-21	
g	FVD2-4	YNT-1614	

Note 1. To connect these models to a terminal block, be sure to use the screws that come with the terminal block.
2. Alphabets in the table indicate crimping tools. For crimp terminals and applicable tools, refer to table 2.
3. Select wire sizes depending on the rated output of the servo motors. The values in the table are sizes based on rated output of the servo amplifiers.

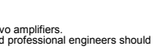
Note 1. Coat the crimping part with an insulation tube.
2. Some crimp terminals may not be mounted depending on their sizes. Make sure to use the recommended ones or equivalent ones.

(2) Selection example of MCCB and fuse
Use a fuse (T class) or the molded-case circuit breaker (UL489 Listed MCCB) indicated in the table below. The T class fuses and molded-case circuit breakers in the table are selected examples based on rated I/O of the servo amplifiers. When you select a smaller capacity servo motor to connect it to the servo amplifier, you can also use smaller capacity T class fuses or molded-case circuit breaker than ones in the table. For selecting ones other than Class T fuses and molded-case circuit breakers below, refer to each servo amplifier instruction manual.

Converter unit	Drive unit	Molded-case circuit breaker (240 V AC)	Fuse (300 V)
MR-CR55K	MR-J4-DU30K_	NF225-CWU-150A (225 A frame 150 A)	250 A
	MR-J4-DU37K_	NF225-CWU-175A (225 A frame 175 A)	300 A

Converter unit	Drive unit	Molded-case circuit breaker (480 V AC)	Fuse (600 V)
MR-CR55K4	MR-J4-DU30K_4	NF100-HRU-75A (100 A frame 75 A)	125 A
	MR-J4-DU37K_4	NF100-HRU-100A (100 A frame 100 A)	150 A
	MR-J4-DU45K_4	NF100-HRU-100A (100 A frame 100 A)	175 A
	MR-J4-DU55K_4	NF125-SVU-125A (125 A frame 125 A)	200 A

(3) Power supply
This servo amplifier can be used on the condition of overvoltage category III set forth in IEC/EN 60664-1. For the interface power supply, use an external 24 V DC power supply with reinforced insulation on I/O terminals.
(4) Grounding
To prevent an electric shock, always connect the protective earth (PE) terminal (marked ⏚) of the servo amplifier to the protective earth (PE) of the cabinet. Do not connect two grounding cables to the same protective earth (PE) terminal. Always connect cables to the terminals one-to-one.
If using an earth-leakage current breaker, always ground the protective earth (PE) terminal of the servo amplifier to prevent an electric shock. This product can cause a DC current in the protective earthing conductor. Where a residual current-operated protective (RCD: earth-leakage current breaker) device is used for protection in case of direct or indirect contact, only an RCD of Type B is allowed on the supply side of this product.



2.3.2 EU compliance

The MR-J4 servo amplifiers are designed to comply with the following directions to meet requirements for mounting, using, and periodic technical inspections: Machinery directive (2006/42/EC), EMC directive (2004/108/EC), and Low-voltage directive (2006/95/EC).
(1) EMC requirement
MR-J4 servo amplifiers comply with category C3 in accordance with EN 61800-3. As for I/O wires (max. length 10 m. However, 3 m for STO cable for CN8.) and encoder cables (max. length 50 m), use shielded wires and ground the shields. Install an EMC filter and surge protector on the primary side of the servo amplifier. In addition, use a line noise filter for outputs of the servo amplifiers. The following shows recommended products.

EMC filter: Soshin Electric HF3000A-UN series (200 V class), TF3000C-TX series (400 V class)

Surge protector: Okaya Electric Industries RSPD-250-U4 series

Line noise filter: Mitsubishi Electric FR-BIF

MR-J4 Series are not intended to be used on a low-voltage public network which supplies domestic premises; Radio frequency interference is expected if used on such a network. The installer shall provide a guide for Installation and use, including recommended mitigation devices.
(2) For Declaration of Conformity (DoC)
Hereby, MITSUBISHI ELECTRIC EUROPE B.V., declares that the servo amplifiers are in compliance with the necessary requirements and standards (2006/42/EC, 2004/108/EC and 2006/95/EC). For the copy of Declaration of Conformity, contact your local sales office.

2.3.3 USA/Canada compliance

This servo amplifier is designed in compliance with UL 508C and CSA C22.2 No.14.
(1) Installation
The minimum cabinet size is 150% of each MR-J4 servo amplifier's volume. Also, design the cabinet so that the ambient temperature in the cabinet is 55 °C or less. The servo amplifier must be installed in a metal cabinet. Additionally, mount the servo amplifier on a cabinet that the protective earth based on the standard of IEC/EN60204-1 is correctly connected. For environment, the units should be used in open type (UL 50) and overvoltage category shown in table in chapter 8. The servo amplifier needs to be installed at or below of pollution degree 2. For connection, use only copper wires.
(2) Short-circuit current rating (SCCR)
Suitable For Use On A Circuit Capable Of Delivering Not More Than 100 kA rms Symmetrical Amperes, 500 Volts Maximum.
(3) Overload protection characteristics
The MR-J4 servo amplifiers have servo motor overload protective function. (It is set on the basis (full load current) of 120% rated current of the servo amplifier.)
(4) Over-temperature protection for motor
Motor Over temperature sensing is not provided by the drive.
Integral thermal protection(s) is necessary for motor and refer to chapter 4 for the proper connection.
(5) Branch circuit protection
For installation in United States, branch circuit protection must be provided, in accordance with the National Electrical Code and any applicable local codes.
For installation in Canada, branch circuit protection must be provided, in accordance with the Canada Electrical Code and any applicable provincial codes.

2.3.4 South Korea compliance

This product complies with the Radio Wave Law (KC mark) Please note the following to use the product.
이 기기는 업무용 (A급) 전자파적합기기로서 판 매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으 로 합니다.
(The product is for business use (Class A) and meets the electromagnetic compatibility requirements. The seller and the user must note the above point, and use the product in a place except for home.)
In addition, use an EMC filter, surge protector, ferrite core, and line noise filter on the primary side for inputs. Use a ferrite core and line noise filter for outputs. Use a distance greater than 30 m between the product and third party sensitive radio communications.

2.4 General cautions for safety protection and protective measures

Observe the following items to ensure proper use of the MELSERVO MR-J4 servo amplifiers.
(1) For safety components and installing systems, only qualified personnel and professional engineers should perform.
(2) When mounting, installing, and using the MELSERVO MR-J4 servo amplifier, always observe standards and directives applicable in the country.
(3) The item about noises of the test notices in the manuals should be observed.

2.5 Residual risk

(1) Be sure that all safety related switches, relays, sensors, etc., meet the required safety standards.
(2) Perform all risk assessments and safety level certification to the machine or the system as a whole.
(3) If the upper and lower power modules in the servo amplifier are shorted and damaged simultaneously, the servo motor may make a half revolution at a maximum.
(4) Only qualified personnel are authorized to install, start-up, repair or adjust the machines in which these components are installed. Only trained engineers should install and operate the equipment. (ISO 13849-1 Table F.1 No.5)
(5) Separate the wiring for safety observation function from other signal wirings. (ISO 13849-1 Table F.1 No.1)
(6) Protect the cables with appropriate ways (routing them in a cabinet, using a cable guard, etc.).
(7) Keep the required clearance/creepage distance depending on voltage you use.

2.6 Disposal

Disposal of unusable or irreparable devices should always occur in accordance with the applicable country-specific waste disposal regulations. (Example: European Waste 16 02 14)

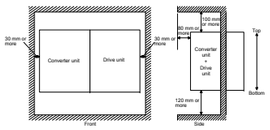
2.7 Lithium battery transportation

To transport lithium batteries, take actions to comply with the instructions and regulations such as the United Nations (UN), the International Civil Aviation Organization (ICAO), and the International Maritime Organization (IMO).
The battery options (MR-BAT6V1SET and MR-BAT6V1) are assembled batteries from two batteries (lithium metal battery CR17335A) which are not subject to the dangerous goods (Class 9) of the UN Recommendations.

3. Mounting/dismounting

Installation direction and clearances

⚠ CAUTION
● The devices must be installed in the specified direction. Not doing so may cause a malfunction.
● Mount the servo amplifier on a cabinet which meets IP54 in the correct vertical direction to maintain pollution degree 2.

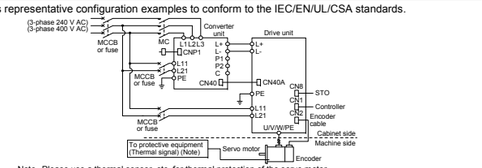


4. Electrical Installation and configuration diagram

⚠ WARNING ● Turn off the molded-case circuit breaker (MCCB) to avoid electrical shocks or damages to the product before starting the installation or wiring.

⚠ CAUTION
● The installation complies with IEC/EN 60204-1. The voltage supply to machines must be 20 ms or more of immunity to instantaneous power failures as specified in IEC/EN 60204-1.
● Connecting a servo motor of the wrong axis to U, V, W, or CN2_ of the servo amplifier may cause a malfunction.

The following shows representative configuration examples to conform to the IEC/EN/UL/CSA standards.



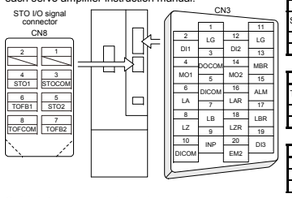
Note. Please use a thermal sensor, etc. for thermal protection of the servo motor.

The control circuit connectors described by rectangles are safely separated from the main circuits described by circles. The connected motors will be limited as follows.
(1) HG/HF/HC/HA series servo motors (Mfg.: Mitsubishi Electric)
(2) Using a servo motor complied with IEC60034-1 and Mitsubishi Electric encoder (OBA, OSA)

5. Signals

5.1 Signal

The following shows MR-J4-DU30KB signals as a typical example. For other servo amplifiers, refer to each servo amplifier instruction manual.



5.2 I/O device

Input device

Symbol	Device	Connector	Pin No.
EM2	Forced stop 2	CN3	20
STOCOM	Common terminal for input signals STO1/STO2	CN8	3
STO1	STO1 state input		4
STO2	STO2 state input		5

Output device

Symbol	Device	Connector	Pin No.
TOFCOM	Common terminal for monitor output signal in STO state	CN8	8
TOFB1	Monitor output signal in STO1 state		6
TOFB2	Monitor output signal in STO2 state		7

Power supply

Symbol	Device	Connector	Pin No.
DICOM	Digital I/F power supply input	CN3	5, 10
DOCOM	Digital I/F common		3
SD	Shield		Plate

6. Maintenance and service

⚠ WARNING ● To avoid an electric shock, only qualified personnel should attempt inspections. For repair and parts replacement, contact your local sales office.

6.1 Inspection items

It is recommended that the following points periodically be checked.
(1) Check for loose terminal block screws. Retighten any loose screws.

Drive unit/converter unit	Tightening torque: [N•m]										
	L1	L2	L3	P1	P2	C	L+	L-	L11	L21	U V W PE
MR-J4-DU30K_/MR-J4-DU37K_/MR-J4-DU45K_4/ MR-J4-DU55K_4							3.0		1.2		12.0
MR-J4-DU30K_/MR-J4-DU37K_4											6.0
MR-J4-CR55K(4)	12.0										12.0

(2) Check servo motor bearings, brake section, etc. for unusual noise.
(3) Check the cables and the like for scratches or cracks. Perform periodic inspection according to operating conditions.
(4) Check that the connectors are securely connected to the servo motor.
(5) Check that the wires are not coming out from the connector.
(6) Check for dust accumulation on the servo amplifier.
(7) Check for unusual noise generated from the servo amplifier.
(8) Check the servo motor shaft and coupling for connection.

6.2 Parts having service lives

Service lives of the following parts are listed below. However, the service life varies depending on operating methods and environment. If any fault is found in the parts, they must be replaced immediately regardless of their service lives. For parts replacement, please contact your local sales office.

Part name	Life guideline
Smoothing capacitor	(Note 3) 10 years
Relay	Number of power-on, forced stop and controller forced stop times: 100,000 times Number of on and off for STO: 100,000 times
Cooling fan	10,000 hours to 30,000 hours (2 years to 3 years)
(Note 1) Battery backup time	Approximately 20,000 hours (equipment power supply: off, ambient temperature: 20 °C)
(Note 2) Battery life	5 years from date of manufacture

Note 1. The time is for using MR-J4 1-axis servo amplifier with a rotary servo motor using MR-BAT6V1SET. For details and other battery backup time, refer to each instruction manual.
2. Quality of the batteries degrades by the storage condition. The battery life is 5 years from the production date regardless of the connection status.
3. The characteristic of smoothing capacitor is deteriorated due to ripple currents, etc. The life of the capacitor greatly depends on ambient temperature and operating conditions. The capacitor will reach the end of its life in 10 years of continuous operation in normal air-conditioned environment (40 °C surrounding air temperature or less).

7. Transportation and storage

⚠ CAUTION
● Transport the products correctly according to their mass.
● Stacking in excess of the limited number of product packages is not allowed.
● Do not hold the front cover to transport the servo amplifier. Otherwise, it may drop.
● For detailed information on transportation and handling of the optional battery, refer to the instruction manual.
● Install the servo amplifier and servo motor in a load-bearing place in accordance with the Instruction Manual.
● Do not get on or put heavy load on the equipment.

When you keep or use it, please fulfill the following environment.

Item			Environment
Ambient temperature	Operation	[°C]	0 to 55 Class 3K3 (IEC/EN 60721-3-3)
	Transportation (Note)	[°C]	-20 to 65 Class 2K4 (IEC/EN 60721-3-2)
	Storage (Note)	[°C]	-20 to 65 Class 1K4 (IEC/EN 60721-3-1)
Ambient humidity	Operation, transportation, storage		5 %RH to 90 %RH
Vibration resistance	Test condition		10 Hz to 57 Hz with constant amplitude of 0.075 mm 57 Hz to 150 Hz with constant acceleration of 9.8 m/s² to IEC/EN 61800-5-1 (Test Fc of IEC 60068-2-6)
	Operation		5.9 m/s²
	Transportation (Note)		Class 2M3 (IEC/EN 60721-3-2)
	Storage		Class 1M2 (IEC/EN 60721-3-2)
Pollution degree			2
IP rating			IP20 (IEC/EN 60529), Terminal block IP00 Open type (UL 50)
Altitude	Operation, storage		1000 m or less above sea level
	Transportation		10000 m or less above sea level

Note. In regular transport packaging

8.Technical data

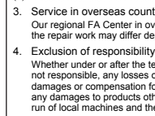
8.1 Converter unit

Item		MR-CR55K	MR-CR55K4
Output	Rated voltage	270 V DC to 324 V DC	513 V DC to 648 V DC
	Rated current [A]	215.9	113.8
Power supply	Main circuit (line voltage)	3-phase 200 V AC to 240 V AC, 50 Hz/60 Hz, 191.3 A	3-phase 380 V AC to 480 V AC, 50 Hz/60 Hz, 100.7 A
	Control circuit (line voltage)	1-phase 200 V AC to 240 V AC, 50 Hz/60 Hz, 0.2 A	1-phase 380 V AC to 480 V AC, 50 Hz/60 Hz, 0.2 A
	Interface (SELV)	24 V DC ± 10% (required current capacity: 130 mA)	
Pollution degree		2 (IEC/EN 60664-1)	
Overvoltage category		3-phase 200 V AC/400 V AC: III (IEC/EN 60664-1)	
Protective class		I (IEC/EN 61800-5-1)	
Short-circuit current rating (SCCR)		100 kA	

8.2 Drive unit

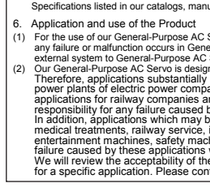
Item		MR-J4-DU30K_	MR-J4-DU37K_	MR-J4-DU30K_4	MR-J4-DU37K_4	MR-J4-DU45K_4	MR-J4-DU55K_4
Output	Rated voltage	3-phase 170 V AC, 360 Hz		3-phase 323 V AC, 360 Hz			
	Rated current [A]	174	204	87	102	131	143
Power supply	Main circuit	The main circuit power of the drive unit is supplied by the converter unit.					
	Control circuit (line voltage)	1-phase 200 V AC to 240 V AC, 50 Hz/60 Hz, 0.2 A		1-phase 380 V AC to 480 V AC, 50 Hz/60 Hz, 0.2 A			
	Interface (SELV)	24 V DC ± 10% (required current capacity: MR-J4-DU_A_: 500 mA; MR-J4-DU_B_: 300 mA)					
Control method		Sine-wave PWM control, current control method					
Safety observation function (STO) IEC/EN 61800-5-2		EN ISO 13849-1 category 3 PL d, IEC 61508 SIL 2, EN 62061 SIL CL 2, and EN 61800-5-2 SIL 2					
Mean time to dangerous failure		MTTFd ≥ 100 [years]					
Effectiveness of fault monitoring of a system or subsystem		DC = 90 [%]					
Average probability of dangerous failures per hour		PFH = 1.68 × 10^{-10} [1/h]					
Mission time		TM = 20 [years]					
Response performance		8 ms or less (STO input off → energy shut off)					
Pollution degree		2 (IEC/EN 60664-1)					
Overvoltage category		3-phase 200 V AC/400 V AC: III (IEC/EN 60664-1)					
Protective class		I (IEC/EN 61800-5-1)					
Short-circuit current rating (SCCR)		100 kA					

8.3 Dimensions



Converter unit/drive unit	Variable dimension table [mm]			Mass [kg]
	W	H	D	
MR-CR55K(4)	300	380	300	22
MR-J4-DU30K_/MR-J4-DU37K_	300	380	300	21
MR-J4-DU30K_4/MR-J4-DU37K_4	240	380	300	16
MR-J4-DU45K_4/MR-J4-DU55K_4	300	380	300	19

8.4 Mounting hole process drawing



Drive unit	Variable dimensions [mm]						Screw size
	W1	W2	W3	W4	W5	H	A
MR-J4-DU30K_ MR-J4-DU37K_ MR-J4-DU45K_4 MR-J4-DU55K_4	300	260 ± 0.5	20	281	9.5	380	M6
MR-J4-DU30K_4 MR-J4-DU37K_4	240	120 ± 0.5	60	222	9	367.5	M5

9.Check list for user documentation

MITSUBISHI ELECTRIC

MR-J4-DU/MR-CR installation checklist for manufacturer/installer

The following items must be satisfied by the initial test operation at least. The manufacturer/installer must be responsible for checking the standards in the items.
Maintain and keep this checklist with related documents of machines to use this for periodic inspection.

1. Is it based on directive/standard applied to the machine? Yes [ ], No [ ]
2. Is directive/standard contained in Declaration of Conformity (DoC)? Yes [ ], No [ ]
3. Does the protection instrument conform to the category required? Yes [ ], No [ ]
4. Are electric shock protective measures (protective class) effective? Yes [ ], No [ ]
5. Is the STO function checked (test of all the shut-off wiring)? Yes [ ], No [ ]

Checking the items will not be instead of the first test operation or periodic inspection by professional engineers.

[Warranty]

1. Warranty period and coverage
We will repair any failure or defect hereinafter referred to as "failure" in our FA equipment hereinafter referred to as the "Product" arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit are repaired or replaced.

[Term]

The term of warranty for Product is twelve (12) months after your purchase or delivery of the Product to a place designated by you or eighteen (18) months from the date of manufacture whichever comes first ("Warranty Period"). Warranty period for repaired Product cannot exceed beyond the original warranty period before any repair work.

[Limitations]

(1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule. It can also be carried out by us or our service company upon your request and the actual cost will be charged. However, it will not be charged if we are responsible for the cause of the failure.
(2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.
(3) Even during the term of warranty, the repair cost will be charged on you in the following cases.
(i) a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
(ii) a failure caused by any alteration, etc. to the Product made on your side without our approval
(iii) a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
(iv) a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
(v) any replacement of consumable parts (battery, fan, smoothing capacitor, etc.)
(vi) a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
(vii) a failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
(viii) any other failures which we are not responsible for or which you acknowledge we are not responsible for

2. Term of warranty after the stop of production
(1) We may accept the repair at charge for another seven (7) years after the production of the product is discontinued. The announcement of the stop of production for each model can be seen in our Sales and Service, etc.
(2) Please note that the Product (including its spare parts) cannot be ordered after its stop of production.

3. Service in overseas countries
Our regional FA Center in overseas countries will accept the repair work of the Product. However, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA center for details.

4. Exclusion of responsibility for compensation against loss of opportunity, secondary loss, etc.
Whether under or after the term of warranty, we assume no responsibility for any damages arisen from causes for which we are not responsible, any losses of opportunity and/or profit incurred by you due to a failure of the Product, any damages, secondary damages or compensation for accidents arisen under a specific circumstance that are foreseen or unforeseen by our company, any damages to products other than the Product, and also compensation for any replacement work, readjustment, start-up test run of local machines and the Product and any other operations conducted by you.

5. Change of Product specifications
Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

6. Application and use of the Product
(1) For the use of our General-Purpose AC Servo, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in General-Purpose AC Servo, and a backup or fail-safe function should operate on an external system to General-Purpose AC Servo when any failure or malfunction occurs.
(2) Our General-Purpose AC Servo is designed and manufactured as a general purpose product for use at general industries. Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used.
In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used.
We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.